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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/810,036	03/26/2004	Dinesh Chopra	500077.12 (29222/US/11)	8438

7590 02/03/2005

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EXAMINER	
NGUYEN, GEORGE BINH MINH	
ART UNIT	**PAPER NUMBER**
3723	

DATE MAILED: 02/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/810,036	CHOPRA ET AL.	
	Examiner	Art Unit	
	George Nguyen	3723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 15-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 15-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *032604*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Receipt is acknowledged of Applicant's preliminary amendment filed on March 26, 2004.

Claims 2-14 and 18-72 were canceled.

Claims 1 and 15-17 are presented for examination.

Receipt is acknowledged of the IDS filed on March 26, 2004 which has been considered and placed of record in the file.

This application has been filed with formal drawings which are acceptable to the examiner.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

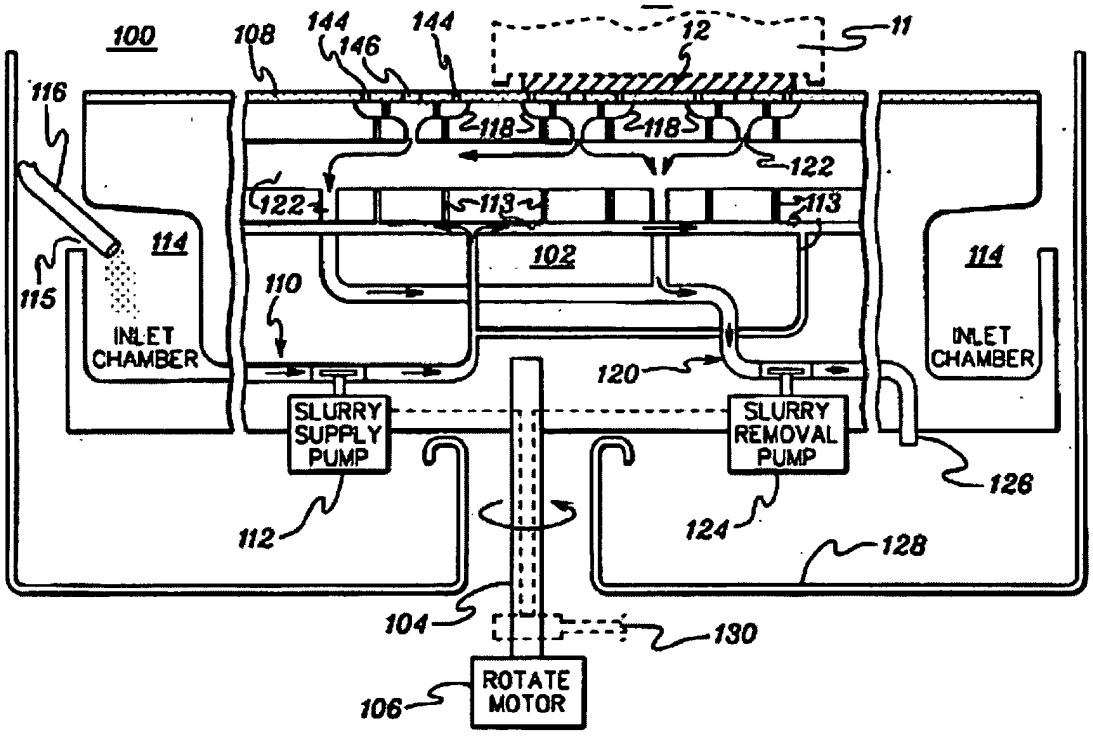
> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1 and 15-16 are rejected under 35 U.S.C. 102(b) as being anticipated by Morgan, III et al.'5,658,185.

With reference to Figures 3 and 4b, col. 3, lines 1-14, Morgan'185 discloses the claimed invention. Please note that Morgan discloses in col. 3, lines 8-10, that "simultaneous with injecting ... through the platen" anticipates the steps of "replacing at least a portion ... onto the planarizing pad" because in claim 15 recites that the "removing" and the "replacing" occur contemporaneously to continuously planarize the substrate assembly.

Regarding to claim 16, pump 124 inherently creates a vacuum to siphon the used slurry through holes 146 into a collecting chamber.

Regarding the limitation of "accumulation zone", in Figure 4b, it is inherently that some of the used slurry is accumulated in the center pad area or the outside edge area adjacent to the planarizing zone.



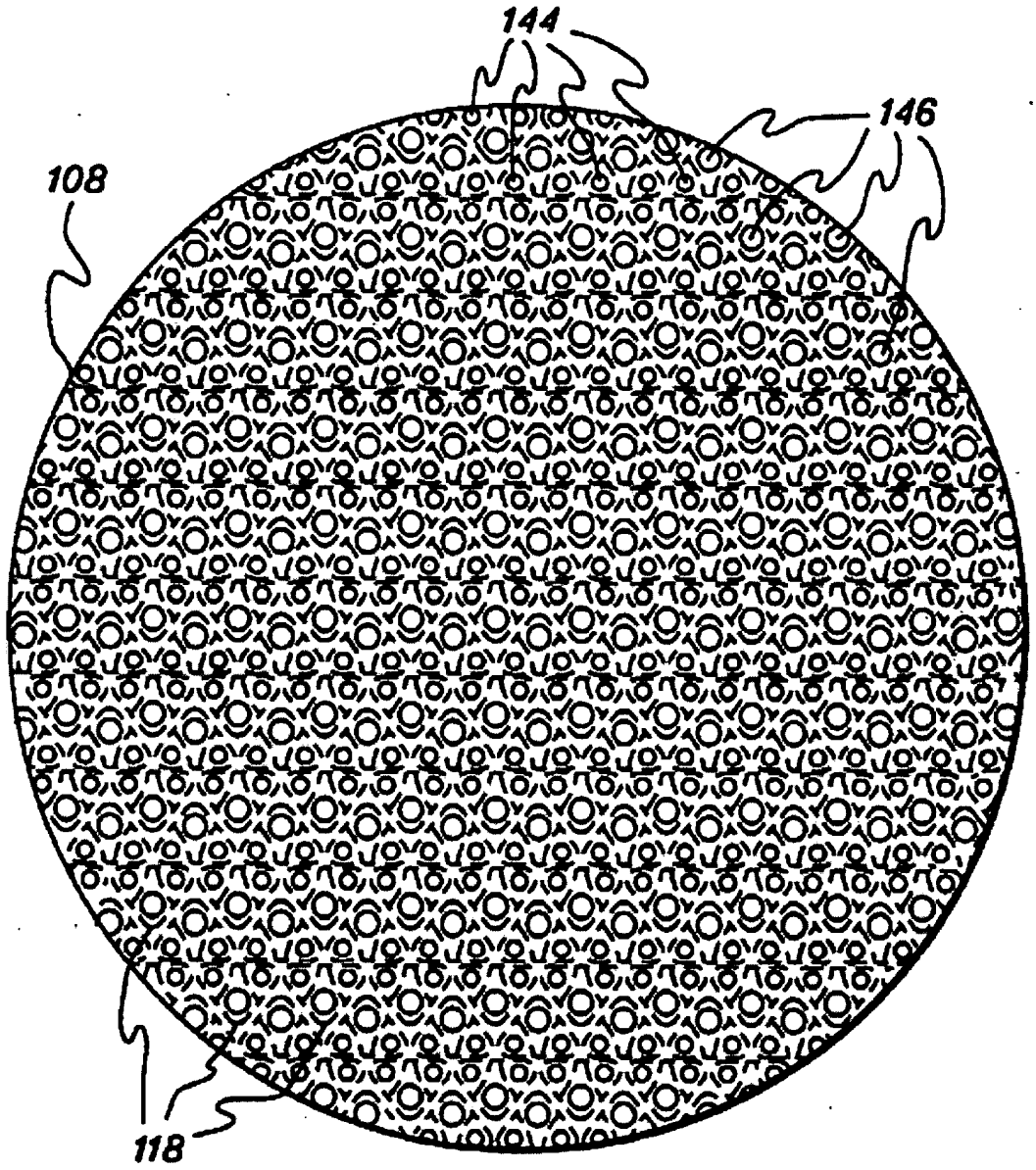


fig. 4b

In still another aspect, a method for polishing a substrate is presented. The method employs a polishing surface disposable against the substrate such that an interface area of the substrate to the polishing surface is defined. The polishing surface resides on a platen. The method comprises: rotating the platen and polishing surface relative to the substrate; injecting a slurry through the platen to the polishing surface within the interface area; and simultaneous with injecting of said slurry, removing slurry from the interface area of the polishing surface through the platen. Preferably, the injecting and removing of slurry are performed to establish an equilibrium of slurry within the interface area of the substrate to the polishing surface.

A chemical-mechanical polishing (CMP) apparatus and method in accordance with this invention encompass numerous advantages over conventional CMP approaches. For example, slurry is supplied to and removed from the area of greatest importance, i.e., the instantaneous interface area of a workpiece, such as a substrate or wafer, with the polishing surface of the apparatus, notwithstanding rotation of the platen and/or workpiece as well as movement of the workpiece linearly relative to the platen. This results in improved slurry quality and control at the instantaneous interface of the workpiece/polishing pad surface. In the case of a semiconductor wafer, an improved wafer surface is obtained upon which to produce topography for reduced depth of focus for photolithography systems. Thus resulting in an increased productivity by decreasing cycle time, decreasing rework requirements for CMP processed wafers, and increasing yields by decreasing overall wafer handling requirements.

BRIEF DESCRIPTION OF DRAWINGS

The subject matter which is regarded as the present invention is particularly pointed out and distinctly claimed in the concluding portion of the specification. The invention, however, both as to organization and methods of practice, together with further objects and advantages thereof, may best be understood by reference to the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is an elevational side view of a conventional rotational chemical-mechanical polishing apparatus;

FIG. 2 is a top plan view of a wafer and polishing pad in the conventional chemical-mechanical polishing apparatus of FIG. 1;

FIG. 3 is a partial cross-sectional elevational view of one embodiment of a chemical-mechanical polishing apparatus in accordance with the present invention; and

FIGS. 4*a* & 4*b* depict in greater detail a slurry delivery system and a slurry removal system for a chemical-mechanical polishing apparatus in accordance with the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

One embodiment of a chemical-mechanical polishing (CMP) apparatus, generally denoted **100**, in accordance with the present invention is depicted in FIGS. 3-4*b*. CMP apparatus **100** includes a platen **102** connected to a rotatable shaft **104** driven by a motor **106**. A polishing pad **108** is disposed at a horizontal, planar upper surface of platen **102**. Pursuant to the invention, the platen and pad include a slurry distribution system **110** and a slurry removal system **120**. Slurry distribution system **110** comprises a first channel system **113** through platen **102**, a slurry supply pump **112** and a circumferentially formed inlet chamber or reservoir **114** having a circumferential opening **115** through which a non-rotating slurry feed tube **116** supplies slurry. Pump **112** controls pumping of slurry from chamber **114**, through first channel system **113**, to a plurality of slurry exchange tubs **118**, from which the slurry passes to polishing pad **108**. Pad **108** includes an array of openings **144** therethrough, each of which is in fluid communication with a corresponding chamber **140** of a slurry exchange tub for transfer of slurry to the polishing surface of the pad, including the area comprising an immediate or "instantaneous interface" of a wafer **12** with the exposed polishing surface of pad **108**. Wafer **12** is maintained against the polishing pad by a conventional carrier **11** (partially shown in phantom). Polishing pad **108** preferably comprises a porous pad, which may or may not have conventional perforations or grooves therein for facilitating the retention and distribution of slurry at the polishing surface.

Film removed from the wafer and other debris, which is suspended within the slurry, is removed from the exposed surface of polishing pad **108** through slurry removal system **120**, which includes a second channel system **122** within the platen in fluid communication with a second array of openings **146** throughout pad **108**. Slurry can be controllably pumped from second channel system **122** by a slurry removal pump **124** for dispensing through a discharge tube **126** into an appropriately sized, non-rotating slurry containment tank **128** surrounding rotating platen **102**. Although not shown, discharged slurry could undergo conditioning to remove debris suspended therein, if desired, and be reintroduced into the polishing process at inlet chamber **114** via inlet tube **116**. Pumps **112** & **124** are conventional type slurry pumps which are electrically controllable. These pumps are connected to a power source via wiring **130** across commutating contacts.

Slurry exchange tubs **118**, which are preferably disposed across the entire upper surface of platen **102**, are shown in greater detail in FIGS. 4*a* & 4*b*. In this embodiment, each tub **118** is configured with two outer chambers **140** and a central chamber **142**. Outer chambers **140** comprise slurry chambers for holding slurry to be forced through corresponding openings **144** of the first array of openings **144** in polishing pad **108**, while central chamber **142** receives slurry with debris suspended therein from a corresponding opening **146** of the second array of openings **146** in polishing pad **108**. Chambers **140** are in fluid communication with first channel system **113**, while central chambers **142** discharge slurry through second channel system **122** of the slurry removal system.

Numerous variations on the basic concept presented herein will be apparent to one skilled in the art. For example, a simple matrix of slurry delivery tubes and slurry removal tubes could be arrayed within the platen and polishing pad. Alternatively, varies geometric shaped tubs could be employed within the platen to facilitate exchange of slurry at the polishing surface of the polishing pad. For example, a circular shaped tub configuration is possible wherein a central slurry outlet is ringed by a plurality of slurry inlets, for example, of smaller diameter than the slurry outlet. In any design, one significant consideration is that slurry equilibrium should be maintained at the polishing surface of the polishing pad. Thus, slurry injection rates should be balanced with slurry removal rates, for example, either through sizing of the openings or providing of an appropriate pressure differential between inlets and outlets using the slurry pumps. Again, the central concept presented herein is to

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1 and 15-16 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 2 of U.S. Patent No. 6,250,994. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter of the application claims is fully disclosed in the patent application and covered by the patented claim. The patented claim are inclusive for they are drafted using the "comprising-style" format and cover the subject matter of the application claims. Since the application has obtained the right to exclude others from making or using the subject matter set forth in the claims of this application by virtue of the patented claim, the issuance of the application into a patent without a terminal disclaimer as provided for under 37 CFR section 1.321 (b) would amount to an extension of this right.

5. Claims 1, 15, and 17 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-14 of U.S.

Patent No. 6,609,957. Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter of the application claims is fully disclosed in the patent application and covered by the patented claim. The patented claim are inclusive for they are drafted using the "comprising-style" format and cover the subject matter of the application claims. Since the application has obtained the right to exclude others from making or using the subject matter set forth in the claims of this application by virtue of the patented claim, the issuance of the application into a patent without a terminal disclaimer as provided for under 37 CFR section 1.321 (b) would amount to an extension of this right.

6. A timely filed terminal disclaimer in compliance with 37 CFR 1.321 (c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground rejection provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

7. Effective January 01, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art listed on the attached PTO 892 are cited to show relevant CMP processes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Nguyen whose telephone number is 571-272-4491. The examiner can normally be reached on Monday-Friday/630AM-300PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Hail can be reached on 571-272-4485. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

GEORGE NGUYEN
PRIMARY EXAMINER

George Nguyen
Primary Examiner
Art Unit 3723

GN – February 02, 2005